REMARKS

This Amendment is in response to the Office Action mailed 26, 2007». Claims 1-10, 12-23, and 25-52 were pending. In this response, claims 1 and 41 have been amended. No claims have been added or cancelled. Therefore, claims 1-10, 12-23, and 25-52 are presented for examination. Reconsideration in light of the amendments and remarks made herein is respectfully requested.

Rejection Under 35 U.S.C. § 103

The Examiner rejects claims 1-4, 5-7, 12-13, 15-21, 24, 29-34, 38-39, 41-44, 45-47 and 52 under 35 U.S.C. § 103(a) as being unpatentable over Li, et al. (U.S. 6,463,177 hererinafter "Li") in view of Anderson (U.S. 6,020,920 hereinafter "Anderson1") further in view of Anderson, et al. (U.S. 5,790,878 hereinafter "Anderson2").

Li describes dynamically changing the size of compressed images based on the number of images stored in a camera (Li, column 1, lines 40-47). The size of stored images are reduced by truncating the least significant portions of the images' bitstreams in order to make room for a newly captured image (Li, column 2, line 60 to column 3, line14). Thus, the system dynamically changes the compression ratio of an image by simply deleting the least significant portion of an image's bitstream.

Anderson1 describes a method and system for displaying pictures on an image capture device's graphical user interface (Anderson1, column 2, lines 35-54). Images are organized within speculation buffers based on a scrolling method of a user and displayed on the graphical user interface (Anderson1, column 2, lines 35-54). The system described by Anderson1 includes a DRAM for storing images utilized by the speculation buffers (Anderson1, Column 4, lines 34-43).

Anderson 2 describes a method and system for a digital camera to recover from a power failure (Anderson 2, column 2, lines 2-14). A power manager in conjunction with a central processing unit may execute within a multi-threading environment of the camera (Anderson2, column 4, lines 15-28). Anderson2, however, merely discusses power management in a multi-threading environment.

Claim 41, as amended, recites:

> A digital camera device, that supports a multithreaded execution environment, with improved latency time between acquiring pictures, the device comprising:
> an image buffer to store digital images;
> a user-activated button, integrated into the digital camera device, for generating a user request to capture a sequence of digital images at the digital camera device, said sequence of digital images being stored in the image buffer upon capture;
> a first compression module, embodied within the digital camera device, for temporarily compressing, with a relatively fast compression technique, at least some of the digital images from the sequence of digital images upon capture, thereby freeing up available storage in said image buffer, wherein the first compression module operates on a high-priority thread in the multithreaded execution environment;
> a buffer to store a temporarily compressed image;
> a decompression module, embodied within the digital camera device, for decompressing the digital images that were temporarily compressed and, to defer said decompressing of the digital images until high priority tasks in the high-priority thread have been processed by the digital camera device; and
> a second compression module, embodied within the digital camera device, for compressing the decompressed digital images that were temporarily compressed more thoroughly than that provided by said first compression module, prior to storing the image in a non-volatile memory, wherein the decompression module and the second compression module operate on a low-priority thread subordinate to the high priority thread of the first compression module in the multithreaded execution environment.

That is, claim 41 includes a multi-threaded camera device with a first compression module for temporarily compressing digital images, where the first compression module operates on a high-priority thread in the multithreaded execution environment. Decompression of the temporarily compressed images is deferred until the tasks in the high-priority thread have been completed.

Then the temporarily compressed images are decompressed and more-thoroughly recompressed prior to storing the image in a non-volatile memory. The decompression module and the second compression module operate on a low priority thread that is subordinate to the high priority thread of the first compression module. The result of the prioritized compression processes of the compression module, decompression module, and second compression module is an improved allocation/preservation of camera resources while preserving the quality of images upon ultimate storage.

Anderson1, as discussed above, provides for speculative decompression based on user scrolling. Anderson1, however, fails to describe or suggest a compression module operating on a high priority thread, a decompression module and a second compression module operating on a low priority thread, or that the low priority thread is subordinate to the high priority thread and does not execute in the multithreaded environment until high priority tasks in the high priority thread have been processed (*See also*, Office Action, mailed January 26, 2007, page 5).

Li, as discussed above, truncates image bitstreams of compressed embedded image bitstreams to dynamically allocate space within a camera's memory. Li also fails to describe or suggest a compression module operating on a high priority thread, a decompression module and a second compression module operating on a low priority thread, or that the low priority thread is subordinate to the high priority thread and does not execute in the multithreaded environment until high priority tasks in the high priority thread have been processed (*See also*, Office Action, mailed January 26, 2007, page 5).

Although Anderson2 describes a camera that supports a multithreaded environment, Anderson2 states "digital camera devices may utilize multiple software routines running within a multi-threading environment to perform the various steps of capturing, processing, compressing

and storing the image data" (Anderson2, column 1, lines 26-35). Anderson 2, however, only discusses multi-threading camera environments in the context of power failure management. Thus, Anderson2 also fails to describe or suggest a compression module operating on a high priority thread, a decompression module and a second compression module operating on a low priority thread, or that the low priority thread is subordinate to the high priority thread and does not execute in the multithreaded environment until high priority tasks in the high priority thread have been processed (*See* Office Action, mailed January 26, 2007, page 5).

The Examiner states:

> Noted that Li et al. discloses the stored images are decoded (decompression module, column 3, lines 1-14), this means that the stored images have been compressed then decompressed. And noted that Anderson et al. discloses a digital camera, which utilizes multiple software routines running with a multi-threading environment to perform various steps of capturing, processing, compressing and storing the image data (column 1, lines 25-35). Therefore, the feature "to defer said decompression of the digital images until high priority tasks (corresponds to encoding, decoding requantizing in Li et al., column 3, lines 1-14) in the high-priority thread have been processed by the digital camera device" is inherently included in Li et al. and Anderson et al.
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> (Office Action, mailed January 26, 2007, pages 5-6)

As discussed in greater detail below, the Applicants submit that Li fails to describe or suggest including both a first compression module and a second compression module within a digital camera device. For sake of argument, even if Li included multiple compression modules within a digital camera device, Applicants are unclear why "to defer said decompression of the digital images until high priority tasks in the high-priority thread have been processed by the digital camera device" would be inherent in Li, Anderson1, and Anderson2. Li fails to describe the operation of the "other compression techniques" other than what would be required to change compression ratios with the other techniques. Li provides no hint about which method,

embedded image encoding truncation or "other compression techniques," would operate on what threads of Anderson2, and how those techniques might be prioritized. Thus, Applicants submit that a compression module operating on a high priority thread, a decompression module and a second compression module operating on a low priority thread, or that the low priority thread is subordinate to the high priority thread and does not execute in the multithreaded environment until high priority tasks in the high priority thread have been processed, is not inherent in a combination of Li, Anderson1, and Anderson2.

Therefore, Li, Anderson1, and Anderson2, alone or in combination, fail to describe or suggest each and every element claimed by the Applicants.

Additionally, Applicants submit that Li fails to describe or suggest a first compression module and a second compression module within a digital camera device. The Examiner states:

> Li discloses a digital camera which captures and converts images into embedded bitstreams; the images are initially stored as high quality images at low compression ratios (column 1, lines 40-46); then Li discloses that compression ratios can be changed by using other compression techniques (column 3, lines 5-14). Therefore, the Examiner considers the Li does disclose the "other compression techniques" are included in the digital camera.
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> (Office Action, mailed January 26, 2007, page 3).

The Applicants submit, however, that the passages in Li cited by the Examiner teach away from the Examiner's interpretation of Li. In the passages cited by the Examiner, Li recites:

> The invention utilizes an embedded coding scheme to dynamically change the size of compressed images according to the number of stored pictures. A storage-limited device, such as digital camera, captures and converts images into embedded bitstreams. The images are initially stored as high quality images at low compression ratios to fully utilize available memory.
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> (Li, column 1, lines 40-46).

Li further recites:

> A user, therefore, has the option to take fewer high quality images with little or no truncation (memory configuration 12A) or more lower quality images with a higher compression ratio (memory configurations 12B or 12C). Because the images #1, #2 and #3 are encoded into embedded bitstreams, each image can be arbitrarily truncated at the end to make room for additional images. To change compression ratios using other compression techniques, the stored images would first have to be decoded, then requantized and then reencoded at the higher compression ratio. The recompressed images would then have to be restored into memory 12. The embedded encoding technique described above allows less complex memory management system to dynamically allocate memory for new images.
>
> (Li, column 3, lines 1-14).

However, Li urges that "a need remains for a simple dynamic memory management system that maintains the highest possibly image quality for the number of images currently stored in memory" (Li, column 1, line 34-37). Thus Li utilizes an embedded coding scheme in the invention of Li (*See* column 1, lines 40-46), because the embedded encoding technique described in Li allows for less complex memory management systems to dynamically allocate memory for new images (*See* Li, column 3, lines 5-14). The "other compression techniques" noted by Li, however increase complexity and resource consumption, which is the opposite of the express purpose of Li's invention, as discussed above. Thus, Applicants respectfully submit that Li teaches away from including any compression technique, other than the embedded encoding technique taught by Li, in a camera device.

Thus, a combination of Li, Anderson, and Anderson 21 fail to render obvious claim 41 along with its dependent claims. Applicants respectfully request withdrawal of the rejections under § 103.

Claim 1, as amended, recites:

A method for compressing digital images upon capture at a digital camera device, the method comprising:

receiving user input requesting capture of a sequence of digital images at the digital camera device, said digital images being stored in an image buffer;
applying a relatively-fast compression technique to temporarily compress a subset of the digital images upon capture, so as to increase availability of storage in said image buffer for storing other digital images being capture, wherein said digital camera device supports a multithreaded execution environment and wherein said step of applying the relatively-fast compression technique occurs as a high-priority thread within the multithreaded execution environment;
deferring decompression of the subset of the digital images until the digital camera device has processed high-priority tasks in the high-priority thread;
decompressing the subset of the digital images that were temporarily compressed; and thereafter
applying a relatively-thorough compression technique to the decompressed subset of the digital images wherein said steps of decompressing and applying a relatively-thorough compression technique occur on a low-priority thread subordinate to the high-priority thread once the digital camera device has processed the high-priority tasks.

As discussed above, with respect to claim 41, none of Li, Anderson1, and Anderson2, alone or in combination, teach or suggest a compression module operating on a high priority thread, a decompression module and a second compression module operating on a low priority thread, or that the low priority thread is subordinate to the high priority thread and does not execute in the multithreaded environment until high priority tasks in the high priority thread have been processed. Therefore, since none of the references, alone or in combination, teaches or suggests different compression techniques operating on prioritized high and low threads in a digital camera device that supports a multi-threaded execution environment, claim 1 and its dependent claims are also not rendered obvious by Li, Anderson1, and Anderson2.

Applicant respectfully requests that the Examiner withdraw the rejection of claims 1-4, 5-7, 12-13, 15-21, 24, 29-34, 38-39, 41-44, 45-47 and 52 under 35 U.S.C. § 103(a) as being unpatentable over Li, in view of Anderson1, and further in view of Anderson2.

The Examiner rejects claims 8-10, 14, 40, and 48-51 under 35 U.S.C. § 103(a) as being unpatentable over Li, in view of Anderson1, Anderson2, and further in view of Fukuoka (U.S. 6,104,430, hereinafter "Fukuoka").

Fukuoka discloses "a digital electronic camera which can accept various types of input/output cards or memory cards" (Fukuoka, Abstract). However, Fukuoka does not discuss compression, or compression modules.

Therefore, Fukuoka fails remedy the shortcomings of Li and Anderson1 discussed above with respect to claims 1 and 41. Claims 8-10, 14, and 40 include the limitations of claim 1 by virtue of being dependent on claim 1. Claims 48-51 include the limitations of claim 41 by virtue of being dependent on claim 41. Therefore, claims 8-10, 14, 40, and 48-51 are patentable over the combination of Li, Anderson1, and Fukuoka for at least the reasons articulated above with respect to claims 1 and 41, respectively.

Applicant respectfully requests that the Examiner withdraw the rejection of claims 8-10, 14, 40, and 48-51 under 35 U.S.C. § 103(a) as being unpatentable over Li, et al. (U.S. 6,463,177) in view of Anderson (U.S. 6,020,920) and Anderson, et al. (U.S. 5,790,878) further in view of Fukuoka (U.S. 6,104,430).

The Examiner rejects claims 22-23, 25-26 and 36-37 under 35 U.S.C. § 103(a) as being unpatentable over Li, in view of Anderson1, Anderson2, and further in view of Acharya, et al. (U.S. 6,154,493, hereinafter "Acharya1").

Acharya1 discloses "a method that includes splitting raw image data into a plurality of channels including color plane difference channels, and then compressing separately each of these channels using a two-dimensional discrete wavelet transform" (Acharya1, Abstract).

However, Acharya1 does not discuss different compression techniques operating on prioritized threads in a digital camera device that supports a multi-threaded execution environment.

Therefore, Acharya1 fails to remedy the shortcomings of Li and Anderson1 discussed above with respect to claims 1 and 41. Claims 22-23, 25-26, and 36-37 include the limitations of claim 1 by virtue of being dependent on claim 1. Therefore, claims 22-23, 25-26, and 36-37 are patentable over the combination of Li, Anderson1, and Acharya1 for at least the reasons articulated with respect to claim 1.

Applicant respectfully requests that the Examiner withdraw the rejection of claims 22-23, 25-26 and 36-37 under 35 U.S.C. § 103(a) as being unpatentable over Li, et al. (U.S. 6,463,177) in view of Anderson (U.S. 6,020,920) and Anderson, et al. (U.S. 5,790,878) further in view of Acharya, et al. (U.S. 6,154,493).

The Examiner rejects claims 27-28 and 35 under 35 U.S.C. § 103(a) as being unpatentable over Li, in view of Anderson1, Anderson2, and further in view of Acharya, et al. (U.S. 6,195,026, hereinafter "Acharya2").

Acharya2 discloses "A method comprising entropy encoding into bits a set of data values, and packing into storage the entropy encoded bits by reversing the bits of words with unknown length and keeping in blocks the words with known lengths. For instance, in an entropy encoded data set that uses both Huffman coding and zero run coding, the class code may be reversed in bit order from right to left rather left to right while the words of known length such as the zero run code and Huffman pointer are stored left to right in blocks" (Acharya2, Abstract).

However, Acharya2 does not discuss different compression techniques operating on prioritized threads in a digital camera device that supports a multi-threaded execution environment.

Therefore, Acharya2 fails remedy the shortcomings of Li and Anderson1 discussed above with respect to claims 1 and 41. Claims 27-28 and 35 include the limitations of claim 1 by virtue of being dependent on claim 1. Therefore, claims 27-28 and 35 are patentable over the combination of Li, Anderson1, and Acharya2 for at least the reasons articulated with respect to claim 1.

Applicant respectfully requests that the Examiner withdraw the rejection of claims 27-28 and 35 under 35 U.S.C. § 103(a) as being unpatentable over Li, et al. (U.S. 6,463,177) in view of Anderson (U.S. 6,020,920) and Anderson, et al. (U.S. 5,790,878) further in view of Acharya, et al. (U.S. 6, 195,026).

Conclusion

Applicant reserves all rights with respect to the applicability of the doctrine of equivalents. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Authorization is given to treat any concurrent or future reply, requiring a petition for an extension of time under 37 CFR 1.136(a) for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. If any other petition is necessary for consideration of this paper, it is hereby so petitioned.

If a telephone interview would expedite the prosecution of this application, the Examiner is invited to contact William L. Jaffe at (714) 557-3800.

Please charge any shortage in fees in connection with the filing of this paper, including extension of time fees, to Deposit Account 02-2666 and please credit any excess fees to such deposit account.

Respectfully submitted,

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